

Toshiba Mobile Display Co., Ltd.

PRODUCT INFORMATION

31cm COLOUR TFT-LCD MODULE
(12.1 TYPE)
LT121DEE2P00
(p-Si TFT)

FEATURES

- (1) 12.1"XGA(1024x768 pixels) display size for notebook PC
- (2) Light weight, High Brightness(225cd/m²) design
- (3) LVDS interface system (H-Sync, V-Sync)

TENTATIVE

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	255.5(W) x 199.0 (H) x 4.8max(D) mm
Number of Pixels	1024(W) x 768(H) pixels
Active Area	245.76(W) x 184.32(H) mm
Pixel Pitch	0.24(W) x 0.24(H)
Weight (Typ)	156 g
Backlight	Single CCFL, Sidelight type

ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Checked Terminal ⁴⁾
Supply Voltage	V _{DD}	-0.3	+4.0	V	V _{DD} - GND
Input Voltage of Signals	V _{IN}	-0.3	V _{DD} +0.3	V	LVDS interface
FL Driving Voltage	V _{FL}	-	2.0	kV(rms)	
FL Driving Frequency	f _{FL}	-	100	kHz	
Operating Ambient Temperature	T _{OP}	0	+50	°C	
Operating Ambient Humidity	H _{OP}	10	90	%(RH)	
Storage Temperature	T _{STG}	-20	+60	°C	
Storage Humidity	H _{STG}	10	90	%(RH)	
Operating Temperature for Panel	-	0	+60	°C	

ELECTRICAL SPECIFICATION

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	V _{DD}	3.0	3.3	3.6	V	
FL Input Current	I _{FL}	3.0	5.5	6.0	mA(rms)	
FL Driving Voltage	V _{FL}	520	590	660	V(rms)	I _{FL} =5.5mA(rms)(Reference)
FL Driving Frequency	f _{FL}	30	50	60	kHz	
FL Starting Voltage	V _{SFL}	1180	-	1950	V(rms)	0°C

OPTICAL SPECIFICATION (Ta=25°C)

Item	Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (CR)	140	250	---	---	
Response Time	(t _{ON})	---	50	ms	
	(t _{OFF})	---	50	ms	
Luminance (L)	168	225	---	cd/m ²	I _{FL} =5.5 mA(rms)
Viewing Angle	U/D/R/L*	10/30/30/30	-	-	degree

*U: Upper side, D: Down side, R: Right side, L: Left side

*The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by Toshiba Mobile Display or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Toshiba Mobile Display or others.

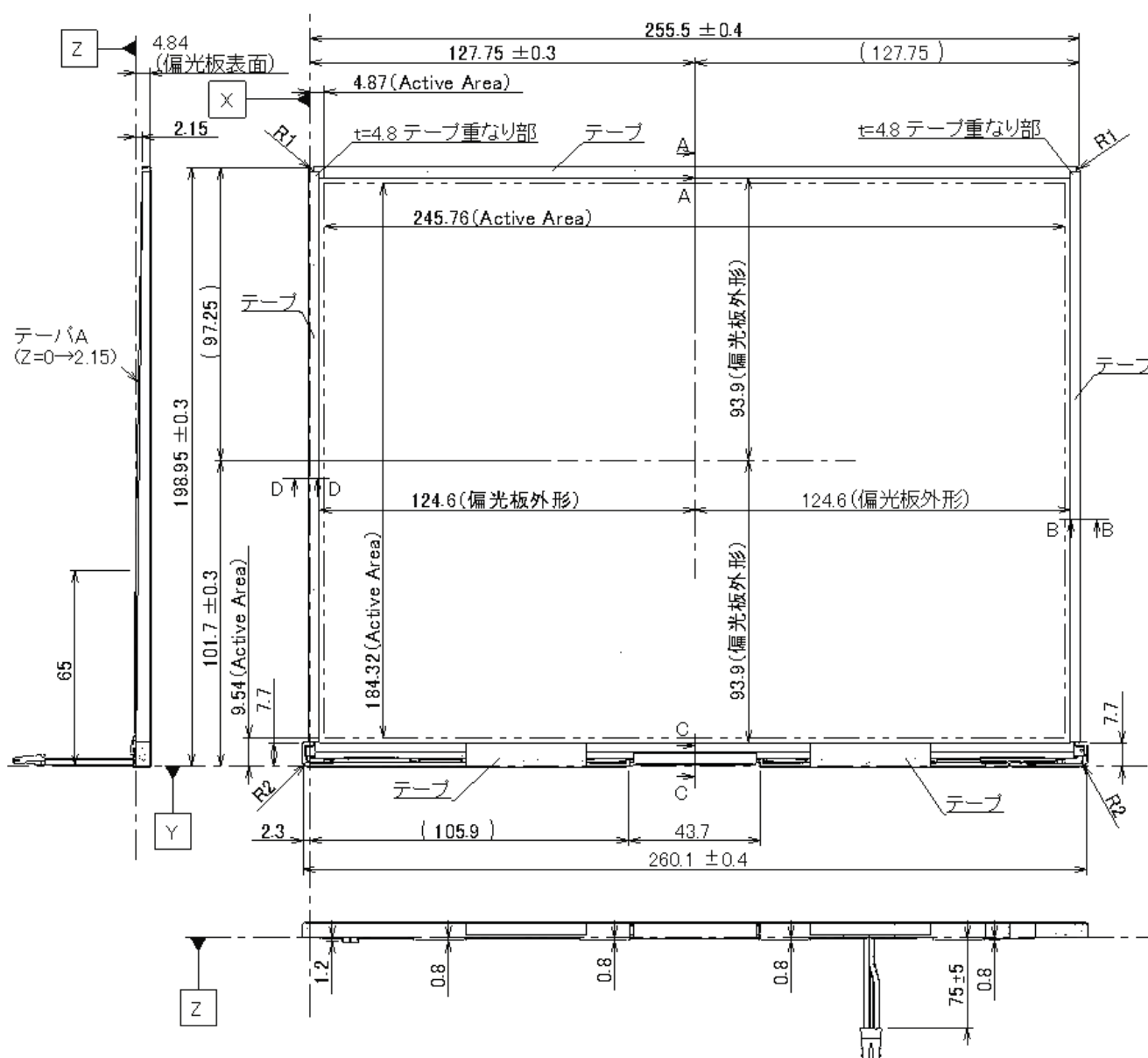
*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba Mobile Display before proceeding with the design of equipment incorporating this product.

DIMENSIONAL OUTLINE

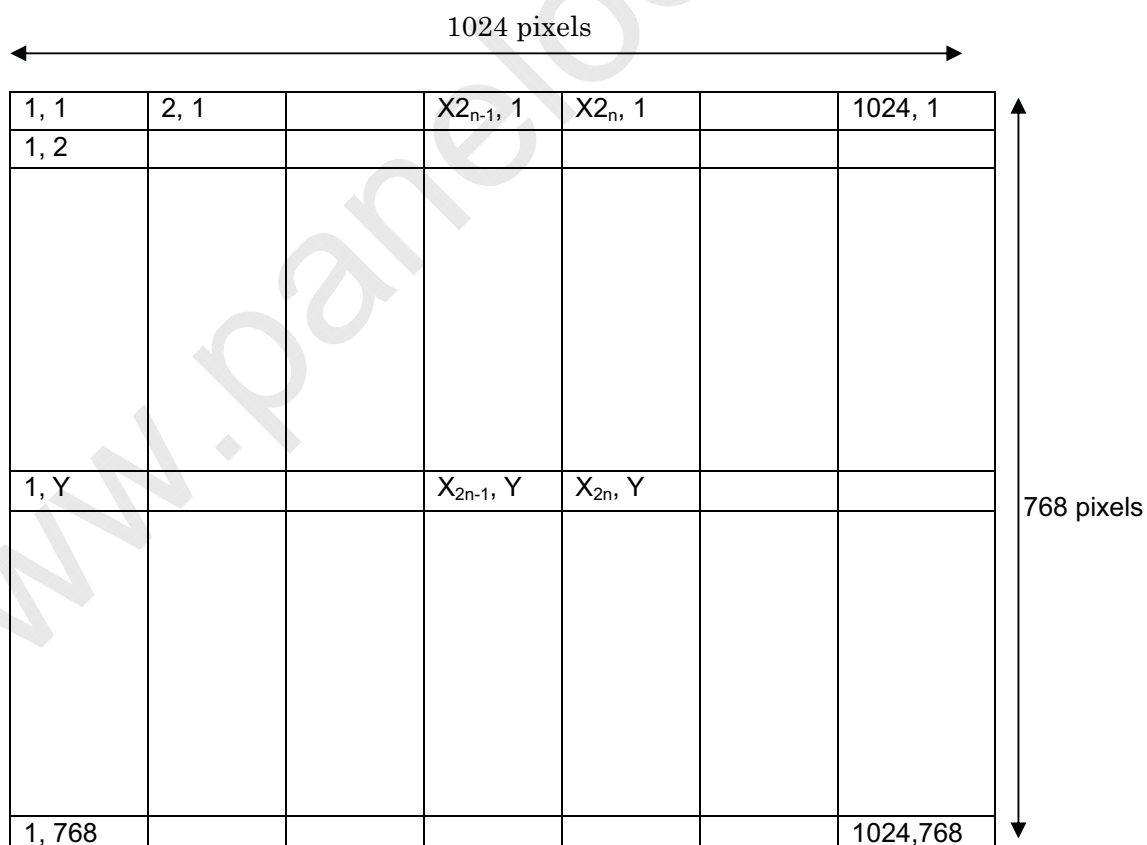
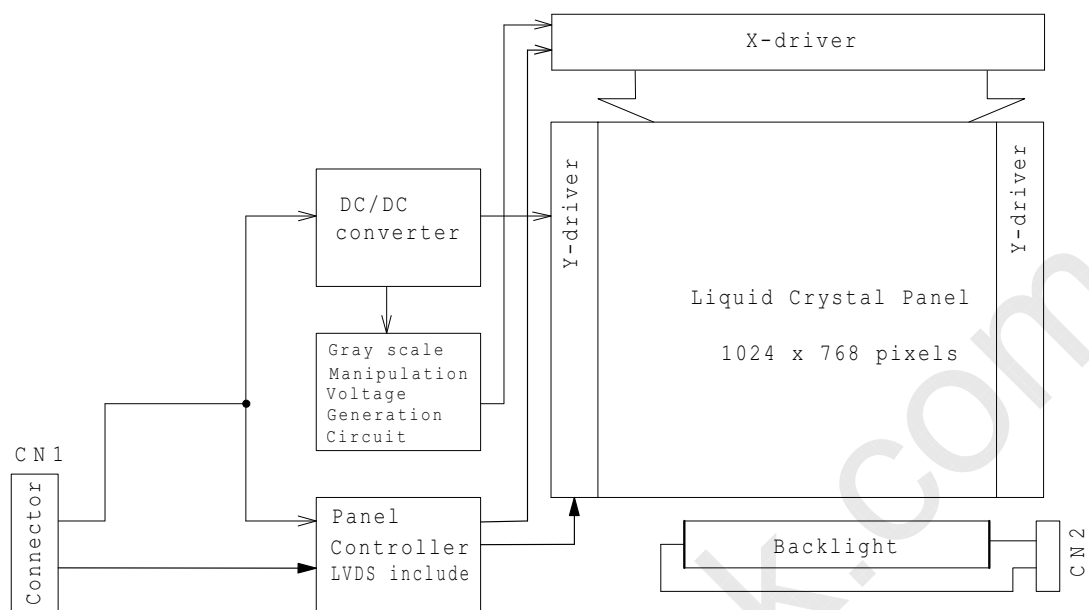
TENTATIVE

Unit : mm

Standard tolerance : ± 0.5

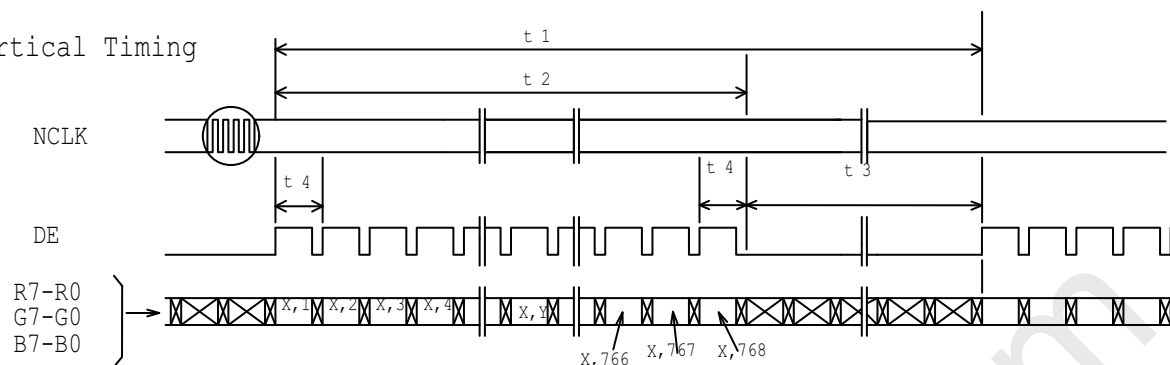


BLOCK DIAGRAM

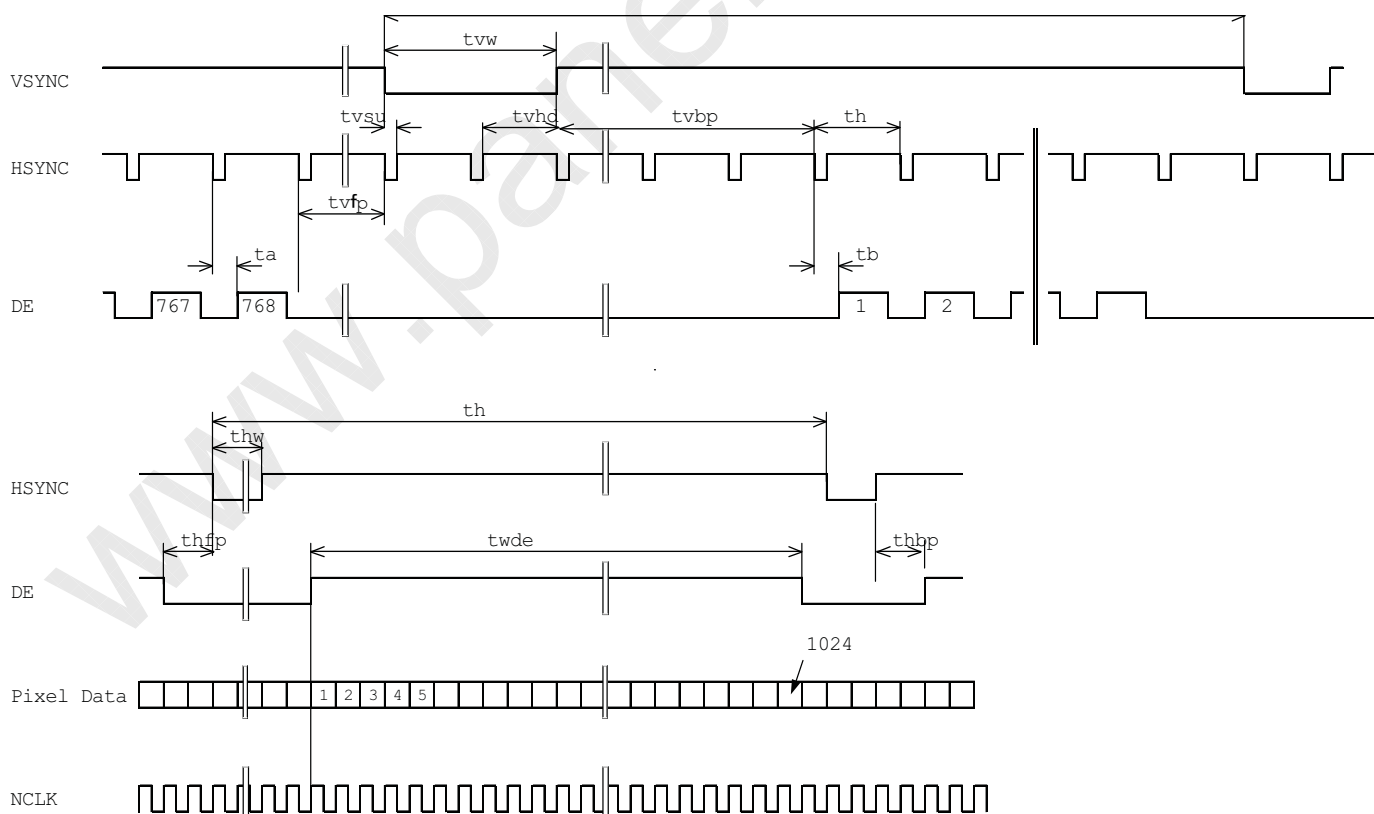
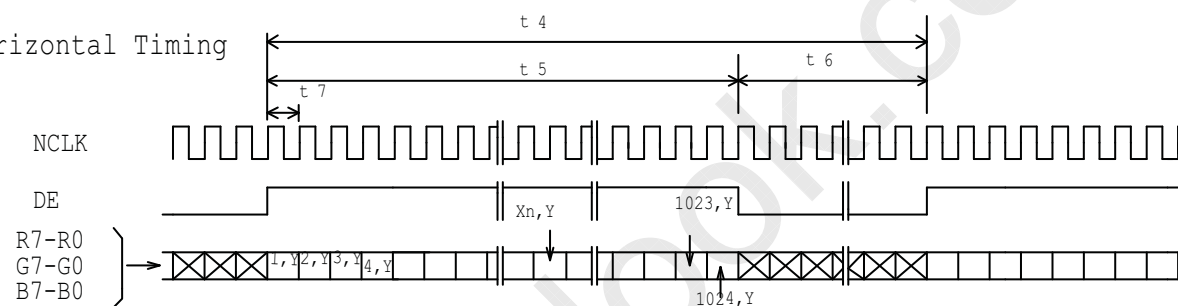


TIMING CHART

(1) Vertical Timing



(2) Horizontal Timing



TIMING SPECIFICATION

Item	Symbol	min.	typ.	max.	unit
Frame Period	t_1	778 x t4	806 x t4	860 x t4	-
Frame Frequency	$1/t_1$	40	60		Hz
Vertical Display Term	t_2	768 x t4	768 x t4	768 x t4	-
Vertical Blanking Term	t_3	10 x t4	38 x t4	92 x t4	-
1 Line Scanning Time	t_4	1319 x t7	1344 x t7	1600 x t7	-
		-	20.68	-	us
Horizontal Display Term	t_5	1024 x t7	1024 x t7	1024 x t7	-
Horizontal Blanking Term	t_6	295 x t7	320 x t7	576 x t7	-
Clock Period	t_7	15	15.38	-	ns
Clock Frequency	$1/t_7$	-	65	66.6	
V-Sync Pulse Width	tvw	2 x t4	-	7 x t4	-
V-Sync Set up Time	tv_{su}	8 x t7	-	-	-
V-Sync Hold Time	tv_{hd}	thbp+16 x t7	-	-	-
Vertical Front Porch	tv_{fp}	2 x t4	-	-	-
Vertical Back Porch	tv_{bp}	6 x t4	-	-	-
Horizontal Period	th	1319 x t7	-	1600 x t7	-
		20.04	-	-	us
H-Sync Pulse Width	thw	8 x t7	-	-	-
Horizontal Front Porch	th_{fp}	4 x t7	-	500 x t7	-
Horizontal Back Porch	th_{bp}	8 x t7	-	492 x t7	-
thw+thbp		16 X t7	-	500 X t7	-
DE Pulse Width	tw_{de}	1024 x t7	1024 x t7	1024 x t7	-

$t_3 = tv_{fp} + tvw + tv_{bp}$

$t_4 = th$

$t_6 = th_{fp} + thw + th_{bp}$

Note 1) Refer to "TIA/EIA Timing Chart"

Note 2) If ENAB is fixed to "H" or "L" level for certain period while NCLK is supplied, the panel displays black with some flicker.

Note 3) If NCLK is fixed to "H" or "L" level for certain period while ENAB is supplied, the panel may be damaged.

Note 4) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality.

There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency), even if the condition satisfies above timing specifications and recommended operating conditions shown in 3.

Note5) Do not make tv , tv_{dh} and tv_{ds} fluctuate.

If tv , tv_{dh} , and tv_{ds} are fluctuate, the panel displays black.

Note6) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note7) NCLK count of each Horizontal Scanning Time should be always the same.

V-Blanking period should be " n " X "Horizontal Scanning Time". (n : integer)

Frame period should be always the same.

**CONNECTOR PIN ASSIGNMENT FOR INTERFACE****CN1 INPUT SIGNAL**

Connector : 20347-030E-02 / I-PEX)

[Mating Connector : Wire Type 20345-030T]

Terminal No.	Symbol	Function
1	NC	NC
2	NC	NC
3	NC	NC
4	NC	NC
5	NC	NC
6	NC	NC
7	NC	NC
8	V _{DD}	POWER SUPPLY : +3.3V
9	V _{DD}	POWER SUPPLY : +3.3V
10	V _{DD}	POWER SUPPLY : +3.3V
11	V _{DD}	POWER SUPPLY : +3.3V
12	V _{SS}	GND
13	V _{SS}	GND
14	NC	NC
15	NC	NC
16	NC	NC
17	NC	NC
18	NC	NC
19	NC	NC
20	V _{SS}	GND
21	V _{SS}	GND
22	RxIN0-	Negative LVDS differential data input , [R0-R5, G0]
23	RxIN0+	Positive LVDS differential data input , [R0-R5, G0]
24	RxIN1-	Negative LVDS differential data input , [G1-G5, B0-B1]
25	RxIN1+	Positive LVDS differential data input , [G1-G5, B0-B1]
26	RxIN2-	Negative LVDS differential data input , [B2-B5, HS, VS, DE]
27	RxIN2+	Positive LVDS differential data input , [B2-B5, HS, VS, DE]
28	RxCLKIN-	Negative LVDS differential clock input
29	RxCLKIN+	Positive LVDS differential clock input
30	V _{SS}	GND

Note 1) Please connect NC pin to nothing. Don't connect it to grand nor to other signal input.

Please connect GND to ground. Don't use it as no-connect nor connection with high impedance.

CN2 CCFL POWER SOURCE

Connector : BHSR-02VS-1/JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

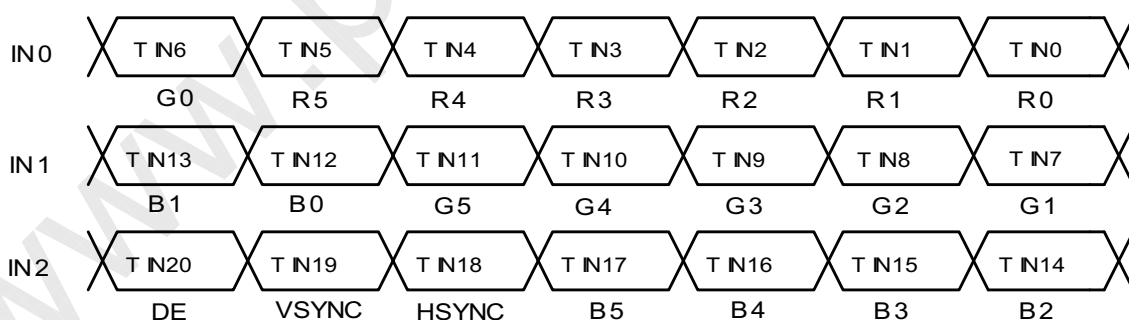
[Mating Connector : SM02B-BHS-1/JAPAN SOLDERLESS TERMINAL MFG CO., LTD.]

Terminal No.	Symbol	Function
1	V _{FLH}	CCFL POWER SUPPLY (HIGH VOLTAGE)
2	V _{FLL}	CCFL POWER SUPPLY (LOW VOLTAGE)

**RECOMMENDED TRANSMITTER (THC63LVDF63A,THC63LVDM63A,THC63LVDM63A-85)
TO LT121DEE2P00 INTERFACE ASSIGNMENT****Case1: 6bit Transmitter**

THC63LVDF63A,THC63LVDM63A,THC63LVDM63A-85				LT121DEE2P00 Interface (CN1)	
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	
Symbol	Terminal	Symbol	Function		
TIN0	44	R0	Red Pixels Display Data (LSB)	TOUT0- TOUT0+	No.22 No.23 IN0- IN0+
TIN1	45	R1	Red Pixels Display Data		
TIN2	47	R2	Red Pixels Display Data		
TIN3	48	R3	Red Pixels Display Data		
TIN4	1	R4	Red Pixels Display Data		
TIN5	3	R5	Red Pixels Display Data (MSB)		
TIN6	4	G0	Green Pixels Display Data (LSB)	TOUT1- TOUT1+	No.24 No.25 IN1- IN1+
TIN7	6	G1	Green Pixels Display Data		
TIN8	7	G2	Green Pixels Display Data		
TIN9	9	G3	Green Pixels Display Data		
TIN10	10	G4	Green Pixels Display Data		
TIN11	12	G5	Green Pixels Display Data (MSB)		
TIN12	13	B0	Blue Pixels Display Data (LSB)	TOUT2- TOUT2+	No.26 No.27 IN2- IN2+
TIN13	15	B1	Blue Pixels Display Data		
TIN14	16	B2	Blue Pixels Display Data		
TIN15	18	B3	Blue Pixels Display Data		
TIN16	19	B4	Blue Pixels Display Data		
TIN17	20	B5	Blue Pixels Display Data (MSB)		
TIN18	22	HSYNC	H-Sync	TCLK OUT- TCLK OUT+	No.28 No.29 CLK- CLK+
TIN19	23	VSYNC	V-Sync		
TIN20	25	DE	Compound Synchronization Signal		
CLK IN	26	CLK	Data Sampling Clock		

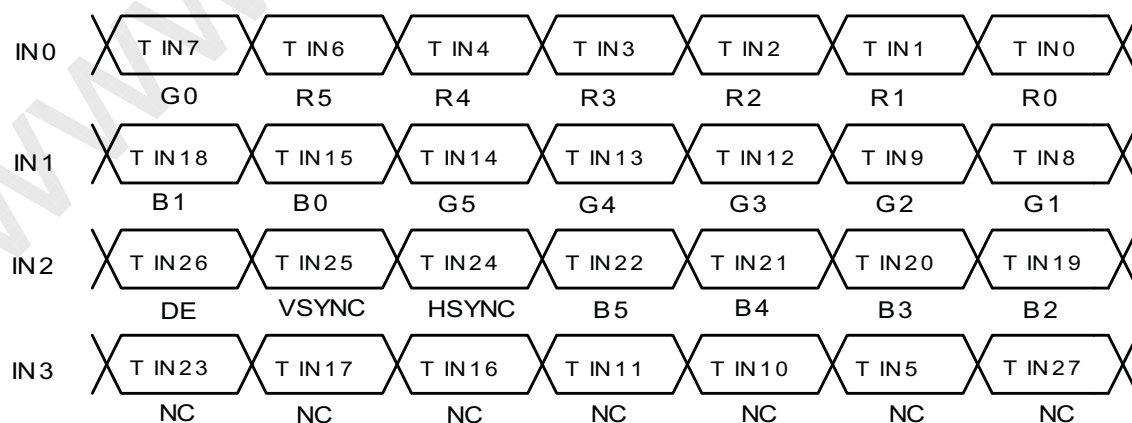
Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.



**RECOMMENDED TRANSMITTER (THC63LVDF63A,THC63LVDM63A,THC63LVDM63A-85)
TO LT121DEE2P00 INTERFACE ASSIGNMENT****Case2: 8bit Transmitter**

THC63LVDF63A,THC63LVDM63A,THC63LVDM63A-85				LT121DEE2P00 Interface (CN1)	
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	Terminal
Symbol	Terminal	Symbol	Function		Symbol
TIN0	51	R0	Red Pixels Display Data (LSB)	TOUT0- TOUT0+	No.22 No.23 IN0- IN0+
TIN1	52	R1	Red Pixels Display Data		
TIN2	54	R2	Red Pixels Display Data		
TIN3	55	R3	Red Pixels Display Data		
TIN4	56	R4	Red Pixels Display Data		
TIN6	3	R5	Red Pixels Display Data (MSB)		
TIN7	4	G0	Green Pixels Display Data(LSB)	TOUT1- TOUT1+	No.24 No.25 IN1- IN1+
TIN8	6	G1	Green Pixels Display Data		
TIN9	7	G2	Green Pixels Display Data		
TIN12	11	G3	Green Pixels Display Data		
TIN13	12	G4	Green Pixels Display Data		
TIN14	14	G5	Green Pixels Display Data(MSB)		
TIN15	15	B0	Blue Pixels Display Data (LSB)	TOUT2- TOUT2+	No.26 No.27 IN2- IN2+
TIN18	19	B1	Blue Pixels Display Data		
TIN19	20	B2	Blue Pixels Display Data		
TIN20	22	B3	Blue Pixels Display Data		
TIN21	23	B4	Blue Pixels Display Data		
TIN22	24	B5	Blue Pixels Display Data (MSB)		
TIN24	27	HSYNC	H-Sync	TOUT3- TOUT3+	
TIN25	28	VSYNC	V-Sync		
TIN26	30	DE	Compound Synchronization Signal		
TIN27	50	NC	Non Connection (open)		
TIN5	2	NC	Non Connection (open)		
TIN10	8	NC	Non Connection (open)		
TIN11	10	NC	Non Connection (open)	TCLK OUT- TCLK OUT+	No.28 No.29 CLK- CLK+
TIN16	16	NC	Non Connection (open)		
TIN17	18	NC	Non Connection (open)		
TIN23	25	NC	Non Connection (open)		
CLK IN	31	CLK	Data Sampling Clock		

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.





LT121DEE2P00

256k (k=1024) COLORS COMBINATION TABLE

	Display	R5 R4 R3 R2 R1 R0	G5 G4 G3 G2 G1 G0	B5 B4 B3 B2 B1 B0	Gray Scale Level
Basic Color	Black	L L L L L L L	L L L L L L L	L L L L L L L	-
	Blue	L L L L L L L	L L L L L L L	H H H H H H H	-
	Green	L L L L L L L	H H H H H H H	L L L L L L L	-
	Light Blue	L L L L L L L	H H H H H H H	H H H H H H H	-
	Red	H H H H H H H	L L L L L L L	L L L L L L L	-
	Purple	H H H H H H H	L L L L L L L	H H H H H H H	-
	Yellow	H H H H H H H	H H H H H H H	L L L L L L L	-
	White	H H H H H H H	H H H H H H H	H H H H H H H	-
Gray Scale of Red	Black	L L L L L L L	L L L L L L L	L L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L L H	L L L L L L L	L L L L L L L	L 1
		L L L L L H L	L L L L L L L	L L L L L L L	L 2
		⋮	⋮	⋮	L3... L60
		H H H H L H	L L L L L L L	L L L L L L L	L61
		H H H H H L	L L L L L L L	L L L L L L L	L62
	Red	H H H H H H	L L L L L L L	L L L L L L L	Red L63
Gray Scale of Green	Black	L L L L L L L	L L L L L L L	L L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L L L	L L L L L L H	L L L L L L L	L 1
		L L L L L L L	L L L L H L	L L L L L L L	L 2
		⋮	⋮	⋮	L3... L60
		L L L L L L L	H H H H L H	L L L L L L L	L61
		L L L L L L L	H H H H H L	L L L L L L L	L62
	Green	L L L L L L L	H H H H H H	L L L L L L L	Green L63
Gray Scale of Blue	Black	L L L L L L L	L L L L L L L	L L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L L L	L L L L L L L	L L L L L L H	L 1
		L L L L L L L	L L L L L L L	L L L L H L	L 2
		⋮	⋮	⋮	L3... L60
		L L L L L L L	L L L L L L L	H H H H L H	L61
		L L L L L L L	L L L L L L L	H H H H H L	L62
	Blue	L L L L L L L	L L L L L L L	H H H H H H	Blue L63
Gray Scale of White & Black	Black	L L L L L L L	L L L L L L L	L L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L L H	L L L L L L H	L L L L L L H	L 1
		L L L L H L	L L L L H L	L L L L H L	L 2
		⋮	⋮	⋮	L3... L60
		H H H H L H	H H H H L H	H H H H L H	L61
		H H H H H L	H H H H H L	H H H H H L	L62
	White	H H H H H H	H H H H H H	H H H H H H	white L63

**FOR SAFETY**

LCD module is generally designed with precise parts to achieve light weighted thin mechanical dimensions.

In using our Modules, make certain that you fully understand and put into practice the warnings and safety precautions detailed in Engineering Information No.EE-D-001A,"CAUTIONS AND INSTRUCTIONS FOR TOSHIBA MOBILE DISPLAY LCD MODULES".

Refer to individual specifications and TECHNICAL DATA sheets (hereinafter called "TD") for more detailed technical information.

1) SPECIAL PURPOSES

A) Toshiba Mobile Display's Standard LCD Modules have not been customized for operation in extreme environments or for use in applications where performance failures could be life-threatening or otherwise catastrophic.

B) Since Toshiba Mobile Display's Standard LCD Modules have not been designed for operation in extreme environments, they must never be used in devices that will be exposed to abnormally high levels of vibration or shock which exceed Toshiba Mobile Display's published specification limits.

C) In addition, since Toshiba Mobile Display's Standard LCD Modules have not been designed for use in applications where performance failures could be life-threatening or catastrophic, they must never be installed in aircraft navigation control systems (such as, but not limited to Traffic Collision Avoidance System and Air Traffic Indicator), in military defense or weapons systems, in critical industrial process-control systems (e.g., those involved in the production of nuclear energy), or in critical medical device or patient life-support systems.

2) DISASSEMBLING OR MODIFICATION

DO NOT DISASSEMBLE OR MODIFY the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display.

Toshiba Mobile Display does not warrant the module, if customer disassembled or modified it.

3) BREAKAGE OF LCD PANEL

DO NOT INGEST liquid crystal material, DO NOT INHALE this material, and DO NOT CONTACT the material with skin, if LCD panel is broken and liquid crystal material spills out.

If liquid crystal material comes into mouth or eyes, rinse mouth or eyes out with water immediately.

If this material contact with skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

4) GLASS OF LCD PANEL

BE CAREFUL WITH CHIPS OF GLASS that may cause injuring fingers or skin, when the glass is broken.

5) ELECTRIC SHOCK

DISCONNECT POWER SUPPLY before handling LCD module.

DO NOT TOUCH the parts inside LCD module and the fluorescent lamp's connector or cables in order to prevent electric shock, because high voltage is supplied to these parts from the inverter unit while power supply is turned on.

6) ABSOLUTE MAXIMUM RATINGS AND POWER PROTECTION CIRCUIT

DO NOT EXCEED the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc., otherwise LCD module may be damaged.

Employ protection circuit for power supply, whenever the specification or TD specifies it.

Suitable protection circuit should be applied for each system design.

7) DISPOSAL

When dispose LCD module, obey to the applicable environmental regulations.